by the apparent motion of the sun, and he considers that it is the *lateral* pressure that causes the barometer to rise to a maximum about half way between local sunrise and local maximum of temperature. He states that an advancing area, which is increasing in the temperature of its lower strata, will cause a high barometer area at a considerable distance in front of itself, and that the reverse occurs during the advance of an area which is diminishing in the temperature of its lower strata. The evening maximum he takes to be a reactionary wave from the afternoon minimum.—Recent foreign studies of thunderstorms, by R. de C. Ward. The author has collected the literature of the subject from the time that Mr. G. J. Symons commenced his observations, in 1856, down to the close of 1892, and gives a general summary of the results of each discussion. The present paper refers entirely to Great Britain.—The Chinook wind, by H. M. Ballou. Comparatively little has yet been written about the Chinook wind; its name is derived from that of the tribe of Chinook Indians living near Puget's Sound. During the prevalence of the wind the thermometer often rises from below zero to 40° or 45° in a few hours. It is analogous to the Föhn in Switzerland, and similar winds are reported from various parts of the world. All that is needed to produce them are high and low pressure areas, whereby the air is caused to pass over the mountains, depositing its moisture during the ascent, and descending on the leeward side. The author gives a list of works bearing upon the subject.—The North Atlantic hurricane of December 22, 1892, by E. Hayden. The paper is accompanied by a map showing the great size and severity of the storm. It is estimated that the area embraced was fully four million square miles, and the author considers that this storm is accountable in some degree for the subsequent very cold weather in North America and Europe.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, February 9.—"Preliminary Account of the Arrangement of the Sympathetic Nervous System, based chiefly on Observations upon Pilo-motor Nerves." I. By J. N. Langley, F.R.S., Fellow of Trinity College, Cambridge. In the cat, the spinal nerves which contain pilo-motor fibres in their nerve-roots, are usually the 4th thoracic to the 3rd lumbar inclusive. The spinal pilo-motor fibres run into the sympathetic trunk, there they become connected with nerve-cells; on leaving the sympathetic chain, they run to their peripheral endings in cranial or spinal nerves. The fibres to the body accompany those dorsal cutaneous branches of the spinal nerves, which supply the skin over and close to the vertebræ. Broadly speaking, the pilo-motor fibres run from the sympathetic chain to the cranial and spinal nerves in the grey rami, but a few fibres may run out in the white rami. Broadly speaking, the fibres issuing from any one ganglion are connected with nerve-cells in that ganglion and with no other sympathetic nerve-cell. In some cases a certain number of such fibres are connected with nerve-cells, not in the ganglion from which they issue, but in the ganglion immediately above or below it. The fibres, before and after they have joined nerve-cells, may be called respectively pre-ganglionic and post-ganglionic. Each ganglion, by its post-ganglionic fibres, supplies, in any one individual, a definite portion of skin. The areas supplied by the ganglia from above downwards, starting with the superior cervical ganglion, are, apart from a variable amount of overlapping, successive areas. The cranial rami of the superior cervical ganglion supply the skin of the dorsal part of the head, except a posterior portion, beginning about $1\frac{1}{2}$ cm. behind the anterior level of the ears; this unaffected region we may call the occipital region. The cervical rami of the superior cervical ganglion supply the skin of the occipital region of the head by fibres running in the great occipital (2nd cervical) nerve, and the skin over the first three or four cervical vertebræ by fibres running in the 3rd cervical nerve. The ganglion stellatum, by its cervical rami, supplies the skin from the 3rd and 4th cervical vertebræ to some point between the spine of the 2nd and 3rd thoracic vertebræ. Often its area extends upwards to join the occipital region. The areas supplied by the post-ganglionic pilo-motor fibres of the 3rd, 4th, 5th, and 6th cervical nerves vary in relative size in different individuals: roughly we may take the 3rd nerve as supplying the skin over the first three and a half vertebræ, and the others as supplying successive strips of about two vertebræ each. In the fore leg region, one, two, or three spinal nerves send no cutaneous branches to the mid-line of the back. These are the 7th and 8th cervical, and the 1st thoracic, nerves. Sometimes the 7th, sometimes the 1st, thoracic has such a cutaneous branch; corresponding to the presence or absence of these cutaneous branches is the presence or absence of pilo-motor fibres in the rami which pass from the ganglion stellatum to the respective nerves. The ganglion stellatum also sends pilo-motor fibres to the first four thoracic nerves. From the 5th thoracic nerve downwards (and sometimes from the 4th) there is a ganglion and ramus for each nerve. The distribution of all these rami down to the 4th lumbar may be considered together. The area of the second thoracic ramus (or of the 1st, as mentioned above) follows on the area of the lowest effective cervical ramus. The 4th lumber ramus supplies either the skin over the 7th lumbar vertebra and a small piece of sacrum or the skin over the sacrum. Between the limits just given for the 2nd thoracic and the fourth lumbar the areas follow on each other, the length of each area being about that of a vertebra.

Below the 4th lumbar nerve is the hind leg region, which is like that of the fore leg already mentioned, in so far as one, two, or three nerves have no dorsal cutaneous branches to the mid-line, and the corresponding rami have no pilo-motor fibres. These nerves are the 5th, 6th, and 7th lumbar.

About the end of the sacrum appears to be the dividing line between the areas of the rami which come from above and those which come from below the ineffective ramus or rami. Thus the skin over the lower part of the sacrum may be supplied by the 4th, 5th, or, perhaps, the 6th lumbar ramus, the skin over the upper coccygeal vertebræ by the 7th lumbar or 1st sacral. The second sacral ramus, as a rule, supplies the hairs of the tail just above the level of the anus and over it; the 3rd sacral ramus supplies the hairs for about an inch and a half below the level of the anus. The coccygeal ganglion gives off rami to the several coccygeal nerves, and these supply different lengths of the tail.

It is easily shown that the area of the skin supplied with pilo-motor fibres by the dorsal cutaneous branch of any given spinal nerve is also supplied by it with sensory fibres. And there is good reason for believing that the fibres of the grey ramus of a nerve, *i.e.* the post-ganglionic sympathetic fibres of a spinal nerve, have in the main the same distribution in the skin as the sensory fibres of the nerve.

Each spinal nerve, from the 1st cervical to the 3rd lumbar, sends fibres to 7 or 8 sympathetic ganglia. For the details of this connection we must refer to the figure appended to the paper.

March 23.—"On the Variation of Surface Energy with Temperature," by William Ramsay, Ph.D., F.R.S., and John Shields, B.Sc., Ph.D.

It is shown that a close analogy exists between the equation for gases,

$$pv = RT,$$

and an equation expressing the relation of surface energy to temperature,

$$\gamma s = \kappa\tau,$$

where γ is surface tension; s, surface; κ, a constant; and τ, temperature measured downwards from a point about 6° below the critical point of the fluid. As the origin of T in the gaseous equation is where $p = 0$, so the origin of τ should be where $\gamma = 0$. Correcting the above equation so that τ shall represent the number of degrees measured downwards from the critical point, the equation becomes

$$\gamma s = \kappa(\tau - d).$$

But even this equation does not express the whole truth. For at temperatures less than 30° below the critical temperature, the relation between surface energy and temperature is not a rectilinear one; a correction is therefore introduced in the form of a second term, which becomes insignificant at temperatures more than 25° or 30° τ; it is

$$\gamma s = \kappa\tau - \kappa d(1 - 10^{-\lambda\tau}).$$

The liquids examined were: ether, methyl formate, ethyl acetate, carbon tetrachloride, benzene, chlorobenzene, acetic acid, and methyl and ethyl alcohols; in fact, the only ones for which data are available. For, in order to calculate γ from the rise in a capillary tube, it is necessary to know the density of the orthobaric liquid and gas; and trustworthy data exist only for these liquids and for a few others which resemble them closely, *e.g.* fluorobenzene, bromobenzene, &c. Also to calculate *s*, *i.e. molecular* surface, it is necessary to know the molecular volume of the liquid, and to raise it to the $\frac{2}{3}$rds power. Hence $v^{\frac{2}{3}} = s$, or molecular surface; *i.e.* it is possible to compare different liquids on the surfaces of which equal numbers of molecules lie.

Measurements were made at – 89°·8, the boiling point of nitrous oxide under atmospheric pressure, with ether, methyl formate, ethyl acetate, and the two alcohols; the other substances are solid at that low temperature. These observations confirmed the rectilinear relation with the first three; but in the case of the two alcohols evidence was obtained of molecular association, as also with acetic acid. It is possible to calculate the amount of association at any temperature in such cases. For, as κ is approximately constant for the molecular surface of the "normal" liquids, the equation

$$\kappa/d = x^{\frac{2}{3}},$$

where d is the differential coefficient of an associating liquid, and x is the molecular aggregation, gives the number of simple molecules which have united to form a compound at the temperature chosen. For the alcohols at – 90°, and for acetic acid a 20°, the association of molecules approximates to $(C_2H_4O_2)_4$, $(CH_4O)_4$, and $(C_2H_6O)_4$.

We have thus a method by which it is possible to ascertain the molecular complexity of undiluted liquids. The results with the alcohols are shown to agree within resonable limits with those indicated by experiments with strong solutions by Raoult's method.

It is incidentally shown in the course of the paper that there is no angle of contact between liquid and glass, when the liquid surface is in contact only with its own vapour. Ordinary measurements of capillarity give inconstant, and probably inaccurate, results, for it is not the surface tension of the liquid which is measured, but that of a solution of air in the surface film of the liquid.

The paper contains tables and curves exemplifying and illustrating the statements given.

Chemical Society, March 16.—Dr. W. H. Perkin, Vice-President, in the chair.—The following papers were read:—The limits of accuracy of gold bullion assaying and the losses of gold incidental to it, by T. K. Rose. Assays of gold bullion by the ordinary method may be rendered more accurate by the use of a more sensitive balance than is usually employed. The amount of copper or silver contained in the assay piece very considerably influences the "surcharge" or difference in weight between the gold originally present in the assay piece and the cornet finally obtained. The presence of antimony, zinc, tellurium, iron, or nickel reduces the surcharge by quantities which the author has determined. It therefore follows that to ensure accuracy check assays must be made on alloys of the same composition as those under examination. Variations in the surcharge are also caused by changes in temperature of the muffle furnace used in cupellation; a rise of 5° in the temperature usually worked at, viz. about 1064°, is accompanied by a reduction in the surcharge of about 0·01 per 1000. If attention be paid to the point enumerated above, the gold in bullion of a high degree of purity can be determined within ± 0·02 per 1000, the limits of accuracy having been previously considered to be ± 0·10 per 1000. The author has estimated the losses of gold in bullion assays. These are due to absorption by the cupel, volatilisation in the muffle and dissolution in the parting acid.—The volatilisation of gold, by T. K. Rose. The author has determined the loss of gold incurred on heating test pieces of the pure metal or its alloys at temperatures between 1045° and 1300° under various conditions. The loss of gold increases as the temperature rises, pure gold losing four times as much at 1245° as at 1090°. A large amount of gold is volatilised in an atmosphere consisting mainly of carbonic oxide, whilst a small amount only is lost in coal gas. A comparatively small amount of gold is carried away by the more volatile metals, copper appearing to exert an exceptional influence. Metals which are easily volatilised do not appear to be completely driven off at the highest temperatures attained. A larger proportion of gold is lost by alloys which form flat buttons on the cupel than by those which form spherical buttons; it would hence seem that the conditions which lower the surface tension of the gold button also raise the vapour pressure of the metal.—Note on the boiling-point of nitrous oxide at atmospheric pressure, and on the melting-point of solid nitrous oxide, by W. Ramsay and J. Shields. Nitrous oxide boils at – 89°·8, and melts at – 102°·3.—The isomerism of the paraffinic aldoximes, by W. R. Dunstan and T. S. Dymond. The importance of the author's discovery of the existence of two acetaldoximes in connection with the theory of the isomerism of oximes is pointed out. The behaviour of the isomerides towards reagents is very similar, the acetyl derivatives prepared from the liquid and solid modifications appearing identical. Both acetaldoximes are converted by hydrogen chloride into the same hydrochloride. The action of phosphoric chloride on the crystalline aldoxime in ethereal solution at a low temperature yields a product which on hydrolysis gives ammonia and acetic acid, as well as methylamine and formic acid; the same products are obtained in almost the same proportion from the liquid aldoxime at a a high temperature. The two isomerides yield only ammonia and acetic acid when treated with phosphorous chloride. Propionaldoxime, Et.CH : NOH, has hitherto been known only as a liquid boiling at 132°; the authors find, however, that it may be obtained in two forms, the one a liquid and the other a solid melting at 22°. The solid modification is converted into the liquid one by heating, and the liquid form changes slowly into the solid one on cooling; this behaviour is quite similar to that of the isomeric acetaldoximes. The action of reagents on the acet- and propion-aldoximes is also analogous. It would appear from the above results that further study is needed to establish criteria of stereochemical isomerism in the case of these oximes; the authors are therefore still engaged upon the subject.—The mineral waters of Askern, in Yorkshire, by C. H. Bothamley. The author gives analyses of the waters of four wells or springs at Askern. These waters are accredited with considerable therapeutic value.—Note on the distribution of acidic and alkalinic radicles in a solution containing calcium, magnesium, carbonates, and sulphates; and on the composition of mineral waters, by C. H. Bothamley. The author concludes that if the question of ionic dissociation in solution be put on one side, and mineral waters and solutions of calcium, magnesium, and the carbonic and sulphuric acid radicles, be represented as containing salts as such, the sulphuric radicle must be regarded as combining by preference with magnesium and not with calcium, as is generally supposed.—A magnesium compound of diphenyl, by W. R. Hodgkinson. Magnesium has no action on dry aniline, toluidine, form- and acet-anilid and phthalanil; phenylhydrazine begins to act on magnesium at about 150°, and at higher temperatures the reaction becomes very violent. Aniline benzene, ammonia, and nitrogen are evolved and a solid whitish substance containing the metal remains in the retort; on heating this residue an oil is obtained which contains diphenyl. These results suggest the presence of magnesium diphenyl.—Note on acetanhydrocitric acid, by F. Klingemann. The author criticises the recent work of Easterfield and Sell on this acid—The dissolution of gold in a solution of potassium cyanide, by R. C. Maclaurin. The author shows that the dissolution of gold in potassium cyanide solution is conditioned by the presence of oxygen, and that the amounts of oxygen absorbed and of gold dissolved are in the proportion indicated by Elsner's original equation—

$$4Au + 8KCN + O_2 + 2H_2O = 4AuCN, KCN + 4KHO.$$

Furthermore, it is shown that the rate of dissolution varies with the strength of the solution and that it passes through a maximum in passing from dilute to concentrated solutions; this variation is traced to a decrease in the solubility of oxygen in solutions of potassium cyanide as the concentration increases.

March 27.—Annual General Meeting.—Prof. Crum Brown, F.R.S., President, in the chair.—The President delivered an address in which he discussed the history of the phlogistic theory and its gradual displacement by more modern views. The balance-sheet for the past year was then presented, and the usual votes of thanks passed. A ballot was then taken for the election of officers and Council for the present year.

Mathematical Society, April 13.—Mr. A. B. Kempe, F.R.S., President, in the chair.—The President, calling attention to the title of a paper he had read at the January meeting on the application of Clifford's graphs to ordinary binary quantics (*ante*, p. 382), said that the subject being there regarded from Prof. Clifford's point of view, he had, following the precedent set in a paper by the late Mr. Spottiswoode on Clifford's graphs, associated the name of Clifford only with the graphs in the title. He had, however, on further consideration come to the conclusion that by such exclusive association an impression might be created which would operate unjustly towards the unquestionable originality of the paper by Prof. Sylvester on the application of the new atomic theory to the graphical representation of the invariants and covariants of binary quantics published in the *American Journal of Mathematics*, vol. i. p. 64. By permission of the council he proposed therefore to alter the title of his paper by referring therein to the graphs as "the Sylvester-Clifford graphs."—The following communications were made:—Toroidal functions, by A. B. Basset, F.R.S. The object of this paper is to develop the theory of toroidal functions from a point of view which brings out its connection with the associated functions

$$\mathrm{P}^m_n(\nu),\ \mathrm{Q}^m_n(\nu),$$

which occur in spherical and spheroidal harmonic analysis. A toroidal function is an associated function of degree $n-\frac{1}{2}$ and order m, where n is zero or any positive integer, and m is zero or any positive integer not greater than n. The paper commences by showing that these functions may be expressed in terms of the definite integrals—

$$\mathrm{P}^m_n(\nu)=\frac{(-)^m\Gamma(n+\frac{1}{2})}{\Gamma(n-m+\frac{1}{2}}\int_0^\pi\frac{\cos m\phi d\phi}{\{\nu+(\nu^2-1)^{\frac{1}{2}}\cos\phi\}^{n+\frac{1}{2}}},$$

and

$$\mathrm{Q}^m_n(\nu)=\frac{(-)^m\Gamma(n+\frac{1}{2})}{\Gamma(n-m+\frac{1}{2})}\int_0^\infty\frac{\cosh m\phi d\phi}{\{\nu+(\nu^2-1)^{\frac{1}{2}}\cosh\phi\}^{n+\frac{1}{2}}}.$$

It can easily be proved that these definite integrals satisfy the differential equations for toroidal functions, and the advantages of this method of procedure are twofold. In the first place these integrals lead to certain difference and mixed difference equations connecting functions of different orders and degrees; and in the second place the whole of the analysis and the results will apply when n is changed into $n+\frac{1}{2}$, in which case the integrals become ordinary associated functions. In physical investigations connected with circular vortex rings, functions of degree n and order unity occur, whose properties may be more simply deduced from those of the zonal functions; also $\nu=\cosh\eta$, when η is very large. If, therefore, $\epsilon^{-\eta}=k$, k will be small, and appropriate series can be obtained in terms of k. The latter part of the paper is occupied with the investigation of these series, and it is shown that

$$\mathrm{Q}_n=k^{n+\frac{1}{2}}\sum_0^\infty\mathrm{A}_s k^{2s},$$

whilst

$$\mathrm{P}_n=k^{-n+\frac{1}{2}}(\phi_n\log 4/k+\psi_n),$$

where ϕn, ψn are infinite series of powers of k^2.—Note on the problem to inscribe in one of two given triangles a triangle similar to the other, by Mr. J. Griffiths. The writer discusses the following propositions: (1) A triangle DEF inscribed in a given triangle ABC, so as to be similar to another given one A'B'C', belongs to some one of twelve systems of similar in-triangles, each system having a centre of similitude of its own. (2) The centres of similitude of the twelve systems in question can be formed into two groups of six points which lie respectively on two circles, inverse to each other with respect to the circumcircle ABC. (3) The centre of similitude of any system of similar triangles inscribed in ABC and having a common Brocard angle equal to that of A'B'C' will lie on one or other of the above circles. (4) As a particular case of the problem the different systems formed by a triangle DEF inscribed in ABC, so as to be either directly or inversely similar to it are noticed.—The singularity of the optical wave-surface, by J. Larmor, F.R.S. It is shown that two sheets of a wave-surface cannot intersect along a curve. As the elastic quality of a crystalline medium is gradually altered, the separate sheets of its (mechanical) wave-surface may draw together, and may finally come into contact at one or more conical points; but any further alteration in the same direction produces instability. The existence of the abnormality of conical refraction would thus be, on a purely elastic theory, an indication of the immediate approach of instability.—On a problem of conformal representation, by Prof. W. Burnside. The paper deals with those cases in which a rectangular polygon can be represented conformally on a circle or half plane by means of an integral equation between two complex variables. It is formally proved that whenever the polygon can be formed by the juxtaposition of equal and similar figures either

(i) triangle $\frac{\pi}{2}\cdot\frac{\pi}{3}\cdot\frac{\pi}{6}$
(ii) triangle $\frac{\pi}{4}\cdot\frac{\pi}{4}\cdot\frac{\pi}{2}$
(iii) any rectangle

the representation is possible by such an integral equation, and that it is not possible in any other case. A general method for finding the equation carrying out the representation is given, and a few special cases are worked at length. The paper finishes by considering shortly the case in which the polygon is not simply connected, and one or two other allied points.

Linnean Society, April 20.—Prof. Stewart, President, in the chair.—In view of the approaching anniversary meeting the election of auditors took place, when Dr. Meiklejohn and Mr. E. A. Batters were nominated on behalf of the Council, and Messrs. Thomas Christy and W. F. Kirby on behalf of the Fellows.—The President took occasion to notice the retirement of Mr. F. H. Kingston after thirty-six years' service as lodge-keeper, and presented him with a testimonial in the shape of a cigar case containing five and thirty pounds in bank-notes, which had been subscribed on his behalf by all the societies in Burlington House. After a suitable response on the part of the recipient, attention was directed to some photographs of Burlington House with the gateway as it existed before the rebuilding in 1868, and showing the old colonnade which had since been demolished and was lying still uncared for in Battersea Park.—On behalf of Mr. C. Chilton of Dunedin, N.Z., Mr. W. Perry Sladen gave an abstract of a paper on the subterranean crustacea of New Zealand, with remarks on the fauna of caves and wells. The paper contained a *résumé* of previous publications on the subject with additional information from the author's own observation, and an expression of his views on certain controversial points in connection therewith. His remarks were criticised by the President and by Prof. Howes, Dr. Henry Power and Mr. G. Fookes.—A paper was then read by Mr. H. M. Bernard on the anatomy, physiology, and histology of the *Chernetidæ*, with special reference to the rudimentary stigmata, and to a new form of trachea, on which an interesting discussion ensued, and Mr. Bernard replied to the criticisms which were offered.—The society adjourned to May 4.

Paris.

Academy of Sciences, April 24.—M. Lœwy in the chair.—On the observation of the partial solar eclipse of April 16, made at the Paris Observatory, by M. F. Tisserand. From a measurement of six photographs obtained by MM. Henry, the instants of contact were calculated to have been 3h. 59m. 51s. and 4h. 27m. 59s.—Recent researches on the nitrogen-fixing micro-organisms, by M. Berthelot. From a series of experiments upon samples of earth taken from the Botanic Garden of the École de Pharmacie, it appears that the micro-organisms capable of fixing free nitrogen from the air belong to widely varying species, but that the chief agents are certain bacteria of the soil, seven species of which were isolated. The carbon and hydrogen contained in the atmosphere does not appear capable of supporting the life of these bacteria, and their nourishment is chiefly derived from the decomposition of sugar, tartaric acid, and other hydrocarbons supplied by higher organisms. If there is an abundance of combined nitrogen at hand, the bacteria flourish more profusely, and their absorption of free nitrogen, though placed beyond doubt, has certain definite limits. On the whole, it seems that the carbon-fixing and the nitrogen-fixing organisms fulfil mutually supplementary functions.—On the order of successive appearance of the vessels in the parallel formation of the leaves of certain *Compositæ* (*Tragopagon*, &c.), by M. A. Trécul.—Physiological and therapeutic effects of a liquid extracted from the male sexual gland, by MM. Brown-Séquard and d'Arsonval. Samples of the orchitic liquid for subcutaneous injection were offered to all medical men willing to report upon its effects. Over 1200 physicians availed themselves of this offer, and their results are very encouraging. The malady showing the most striking effect of the remedy was locomotor ataxy, of which 314 out of 342 undoubted cases were cured or considerably improved. Another almost incurable disease which proved very amenable to this treatment was shaking paralysis, of which 25 out of 27 cases were much improved. It appears that the orchitic liquid, though not possessing any direct curative influence upon the various morbid states of the organism, is capable on subcutaneous injection of curing or decidedly ameliorating a great variety of affections, organic or otherwise. This action is due to two kinds of influence. By the one, the nervous system gains in vigour, and becomes capable of improving the dynamical or organic state of the diseased parts; by the other, which depends upon the entrance into the blood of new materials, the liquid contributes to the cure of morbid states by the formation of new cellules and other anatomical elements.—Observation of the solar eclipse of April 16, 1893, at the Lyon Observatory, by M. Ch. André.—Observation of the solar eclipse of April 16 at the Algiers Observatory, by M. Ch. Trépied.—Additional note, by M. Spée.—Spectro-photographic method for the study of the solar corona, by M. George Hale.—On the reduction of any differential system to a linear form and integrable completion of the first order, by M. Riquier.—Verification of the steam counter and its application to the measurement of supersaturation and superheating, by M. H. Parenty.—On the tension of saturated water-vapour, by M. Antoine.—On the measurement of large differences of phase in white light, by M. P. Joubin.—On rational systems of expressions in dimensions of electric and magnetic quantities, by M. E. Mercadier.—Measurement of the difference of phase of two sinusoidal currents, by M. Désiré Korda.—Effect of colouring matters upon actino-electric phenomena, by M. H. Rigollot.—Study of ferric chloride and ferric oxalate solutions; distribution of the ferric oxide between the hydrochloric and the oxalic acid, by M. Georges Lemoine.—On some derivatives of licareol, by M. Ph. Barbier.—On the constitution of gallic blue or tannine indigo, by M. P. Cazeneuve.—On the chloramines, by M. A. Berg.—On bromal bornylates, by M. J. Minguin.—Qualitative and quantitative analyses of formaldehyde, by M. A. Trillat.—On dioptase deposits on the French Congo, by M. Alfred Le Chatelier.—On a zirkoniferous felspathic enclosure in the basaltic rocks of the Puy de Montaudou, near Royat, by M. Ferdinand Gonnard.—On a new mineral species discovered in the copper deposits of Boleo (Lower California, Mexico), by M. E. Cumenge.—On the rocks of the porphyritic series in the French Alps, by M. P. Termier.—On the discovery of the Marine carboniferous in the valley of Saint-Amarin (Haute-Alsace), by M. Mathieu Mieg.—Biological conditions of lacustrine vegetation, by M. Ant. Magnin.—Acclimatisation in France of new Salmonidæ, by M. Daguin.

BOOKS, PAMPHLETS, and SERIALS RECEIVED.

BOOKS.—Vertebrate Embryology: Dr. A. Milnes Marshall (Smith, Elder, and Co.)—Chemistry for All: W. J. Harrison and R. J. Bailey (Blackie).—Unités et Etalons: C. E. Guillaume (Paris, Gauthier-Villars).—Principes de la Machine a Vapeur: E. Widmann (Paris, Gauthier-Villars). Smithsonian Institution, Report of U.S. National Museum, 1890 (Washington).—The Soil in Relation to Health: H. A. Miers and R. Crosskey (Macmillan).—Wm. Kitchen Parker, F.R.S.: T. Jeffery Parker (Macmillan).—Types of Animal Life: St. G. Mivart (Osgood).—Advanced Physiography: R. A. Gregory and J. Christie (Hughes).—Gun and Camera in Southern Africa: H. A Bryden (Stanford).—Alembic Club Reprints; No. 1, Experiments upon Magnesia Alba, Quicklime, &c.: Dr. J. Black (Edinburgh, Clay).

PAMPHLETS.—Vererbungsgesetze und ihre Anwendung auf den Menschen: S. S. Buckman (Leipzig, Günthers).—City and Guilds of London Institute; Report to the Governors, April (London).—The Stæchiological Cure of Consumption, &c.: Dr. J. F. Churchill (Stott).

SERIALS.—Quarterly Journal of Microscopical Science, April (Churchill).—Bulletin of the New York Mathematical Society, vol. 2, No. 7 (New York).—Ergebnisse der Meteorologischen Beobachtungen, Jahrgang 2 (Bremen).—Seismological Society of Japan, vol. 1, 1893 (Yokohama).—Geological Magazine, May (K. Paul).—Natural Science, May (Macmillan).

DIARY OF SOCIETIES.

LONDON.

THURSDAY, MAY 4.

ROYAL SOCIETY, at 4.30.—On the Thickness and Electrical Resistance of Thin Liquid Films: Prof. Reinold, F.R.S., and Prof. Rücker, F.R.S.—Organic Oximides; a Research on their Pharmacology: Dr. H. Pomfret.—On the Alleged Increase of Cancer: Geo. King and Dr. Newsholme.—Further Experimental Note on the Correlation of Action of Antagonistic Muscles: Dr. Sherrington. On the Differential Co-variants of Plane Curves, and the Operators Employed in their Development: R. F. Gwyther.

LINNEAN SOCIETY, at 8—Nervous System of Myxine glutinosa: Alfred Sanders.—On Polynesian Plants collected by J. J. Lister; W. B. Hemsley, F.R.S.

CHEMICAL SOCIETY, at 8.—Ballot for the Election of Fellows.—Hydrates of Potassium, Sodium, and Lithium Hydroxides: S. U. Pickering, F.R.S.—Notes on Marsh's and Renich's Tests for Arsenic: Dr. J. Clark—The Formation of Hydrogen Peroxide in Organic Liquids: Dr. A. Richardson.—The Supposed Saponification of Linseed Oil by White Lead: J. B. Hannay and A. E. Leighton.—Notes on the Capillary Separation of Substances in Solution: L. Reed.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The First James Forrest Lecture—The Interdependence of Abstract Science and Engineering: Dr William Anderson, F.R.S.

ROYAL INSTITUTION, at 3.—The Atmosphere: Prof. Dewar, F.R.S.

FRIDAY, MAY 5.

CHEMICAL SOCIETY, at 8.—Hofmann Memorial Meeting.—Address by Right Hon. Lord Playfair, F.R.S.; Sir F. A. Abel, F.R.S.; W. H. Perkin, F.R.S.

ROYAL INSTITUTION, at 9.—Fogs, Clouds, and Lightning: Shelford Bidwell, F.R.S.

SATURDAY, MAY 6.

ROYAL INSTITUTION, at 3.—Johnson and Milton: Dr. Henry Craik, C.B.

MONDAY, MAY 8.

ARISTOTELIAN SOCIETY, at 8.—G. F. Stout.

ROYAL INSTITUTION, at 5.—General Monthly Meeting.

TUESDAY, MAY 9.

INSTITUTION OF CIVIL ENGINEERS, at 8.—Mining and Ore Treatment at Broken Hill, New South Wales: M. B. Jamieson and John Howell. (Discussion.)

ANTHROPOLOGICAL INSTITUTE, at 8.30.—Notes on the Skull of an Aboriginal Australian: C. Dudley Cooper. (Communicated by Prof. G. D. Thane.)—On Borneo: C. Hose.—On the Natives of Tonga: R. G Leefe.

ROYAL INSTITUTION, at 3.—Modern Society in China: Prof. R. K. Douglas.

WEDNESDAY, MAY 10.

GEOLOGICAL SOCIETY, at 8.—On the Felsites and Conglomerates between Bethesda and Llanllyfni, North Wales: Prof. J. F. Blake.—The Llandovery and Associated Rocks of the Neighbourhood of Corwen: Philip Lake and Theodore T. Groom.

ENTOMOLOGICAL SOCIETY, at 7.—Dicranota, a Carnivorous Tipulid Larva: Prof. L. C. Miall, F.R.S.—On a Lepidopterous Pupa (Micropteryx purpurella) with Functionally Active Mandibles: Dr. T. Algernon Chapman.

INSTITUTION OF CIVIL ENGINEERS, at 8.—The Introduction of Rubble Blocks into Concrete Structures: J. Wilson Steven.

THURSDAY, MAY 11.

MATHEMATICAL SOCIETY, at 8.—On some Formulæ of Codazzi and Weingarten in Relation to the Application of Surfaces to each other: Prof. Cayley, F.R.S.—On the Expansion of Certain Infinite Products: Prof. L. J. Rogers.

INSTITUTION OF ELECTRICAL ENGINEERS, at 8.—On the Prevention of Sparking, Compound Dynamos without Series Coils or Magnets; and Self-exciting Dynamos and Motors without Winding upon Field Magnets: W. B. Sayers.

ROYAL INSTITUTION, at 3.—The Atmosphere: Prof. Dewar, F.R.S.

FRIDAY, MAY 12.

PHYSICAL SOCIETY, at 5.—The Drawing of Curves from their Curvature: C. V. Boys, F.R.S.—The Foundations of Dynamics: Oliver Lodge, F.R.S.

ROYAL ASTRONOMICAL SOCIETY, at 8.

ROYAL INSTITUTION, at 9—Isoperimetrical Problems: Lord Kelvin, Pres. R.S.

SATURDAY, MAY 13.

ROYAL BOTANIC SOCIETY, at 3.45.

ROYAL INSTITUTION, at 3.—Johnson and Swift: Dr. Henry Craik, C.B.

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